What a Pilot Should Know About General Thunderstorms

One of the more common hazards to a pilot in the Ohio Valley is the general summertime thunderstorm or "pulse" thunderstorm. What may be a brief downpour and a few rumbles of thunder for the general public can be quite a significant event for a pilot. General, or non-severe thunderstorms, which are mainly caused by intense surface heating lifting parcels of air to a point where they can become thunderstorms, are capable of producing dangerous conditions for an aircraft and pilot. The main threats of a general thunderstorm to aircraft are small hail, wind gusts up to severe criteria, and lightning. Severe criteria is characterized by wind speeds greater than or equal to 58 MPH (50 Knots), hail with 1" or greater diameter, or tornadic activity. Also, heavy to extreme turbulence is a condition found in most thunderstorm updrafts or downdrafts, whether the storm is severe or not. It is important for a pilot to be aware of the environment they are about to fly into. What may seem like a fair weather day, can quickly turn into a sky filled with the dreaded towering cumulus and cumulonimbus.

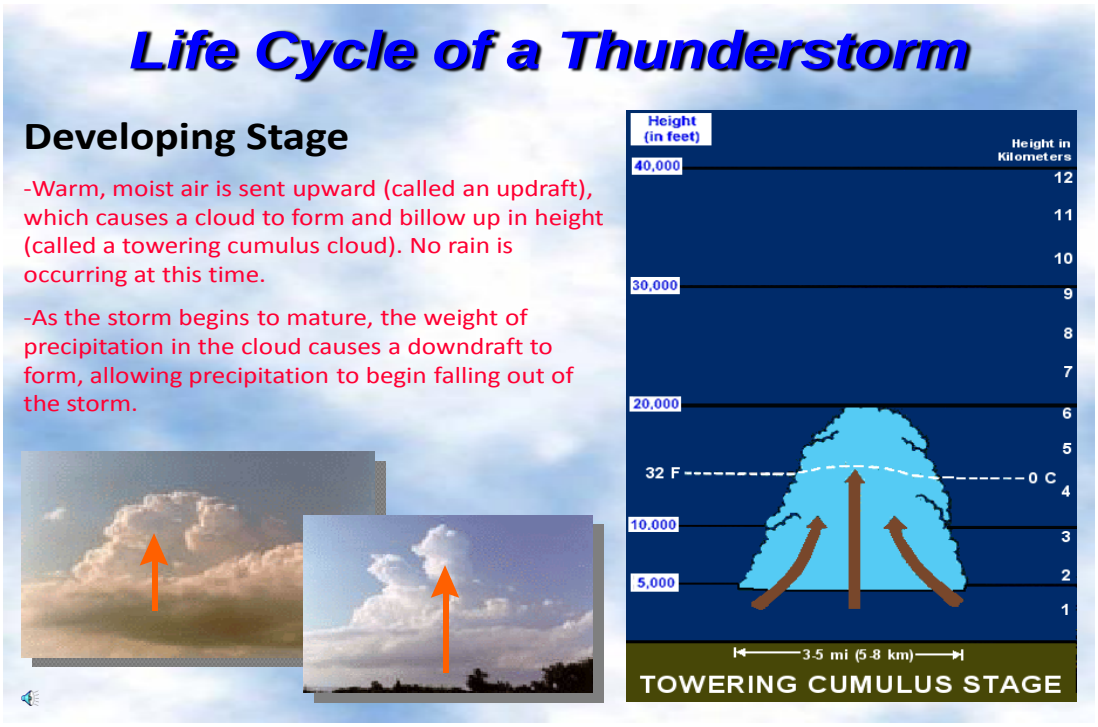
There are quite a few differences between a severe thunderstorm and a general thunderstorm; however, this does not make a general thunderstorm any less dangerous to a pilot. The main difference between the two types of storms is that general thunderstorms lack enough wind shear (change in wind speed and direction with height) to sustain their updrafts. In almost all cases, there has to be sufficient wind shear for a thunderstorm to obtain severe criteria. There are some instances where a general thunderstorm can produce severe conditions very briefly. The nature of the name "pulse" thunderstorm comes from the fact that the storm updraft develops quickly and then dies out just as fast. Once the cloud starts to produce precipitation, there is not enough wind to carry the rain away from the updraft. This causes the updraft to be "choked off" by the rain cooled air and the result is a collapsing thunderstorm. At this point in the thunderstorm lifecycle, it is capable of producing strong to marginally severe downburst winds. The severe thunderstorm differs in the simple fact that there is more wind shear that helps the storm stay "alive" long enough for the storm to organize and produce a severe event. If a storm has a chance to organize, it has the potential to produce more powerful winds and larger hail. However different the two types of storms may be, the bottom line is that both are capable of producing conditions that can be hazardous to small airplanes and the pilots flying them.

The National Weather Service (NWS) routinely issues 24 to 30 hour forecasts for airports in their area. These **T**erminal **A**rea **F**orecasts, or **TAF**s, are designed to reflect current and forecast conditions for airports. The changing atmosphere at an airport is constantly monitored by aviation forecasters, and amended as necessary due to changing conditions. It is important for a pilot to understand that if a TAF mentions thunderstorms in the vicinity (VCTS), this could mean different things. This statement means thunderstorms are expected, however not within a 5 mile radius of a given airport terminal. Whether the storm is right over the airport, in the departure path, or just in the area of the airport is not all the pilot should be concerned about. A thunderstorm has the potential to toss hail out of its updraft or anvil for great distances. Also, lightning can strike as much as twenty miles away from the thunderstorms. Other dangers associated with a thunderstorm in your "vicinity" are low-level winds and wind shear associated

with storm outflow, and deteriorating visibility associated with lowering ceilings and rain showers.

The goal of NWS aviation forecasters is to provide pilots with as much information as possible, so that a pilot can make a good decision about the conditions he/she is about to fly in. There are many products issued by the NWS designed specifically for general aviation pilots to use. There is an aviation section in the **A**rea **F**orecast **D**iscussion (AFD) that is provided daily by the NWS that gives pilots information about conditions and expected trends around the region. The Aviation Weather Center in Kansas City, Missouri provides a link to all available AFDs around the nation (aviationweather.gov/testbed/afd/).

Armed with better knowledge and better tools, pilots will be able to know what kind of environment is going to be around them when they fly. As summertime draws near each year and that "itch" to go flying increases with each beautiful day, we urge you to familiarize yourself with NWS products. When the time comes to fly, an informed decision will be based upon the best information available.

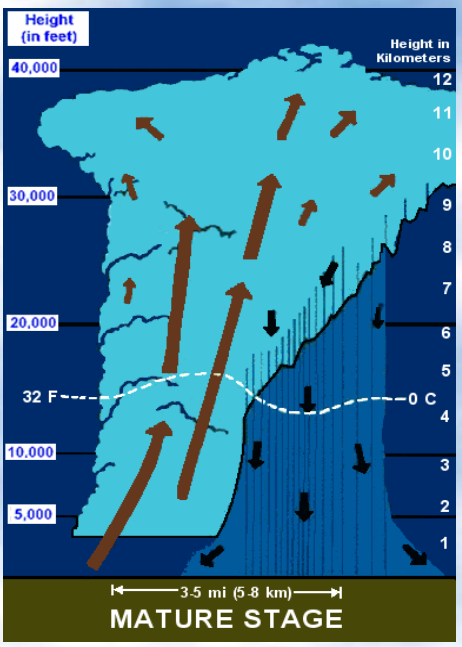


Life Cycle of a Thunderstorm

Mature Stage

-An updraft and downdraft are occurring at the same time within the thunderstorm cloud (called a cumulonimbus cloud).

-Heavy rain, thunder, lightning, and possibly hail and gusty winds are occurring at this time.

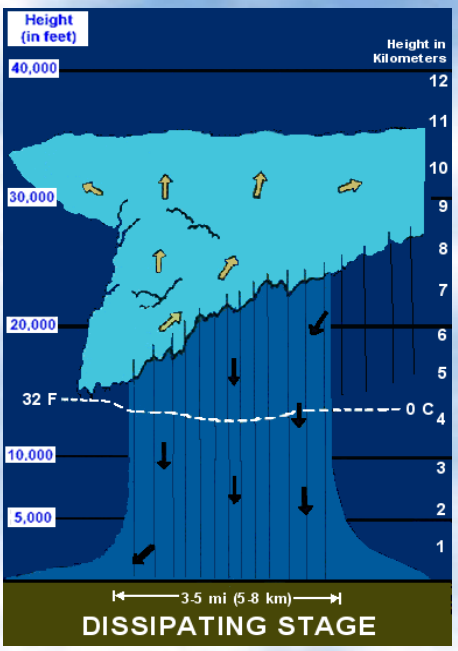


Life Cycle of a Thunderstorm

Weakening Stage

-Storm contains mostly downdrafts, which move away from the storm and cut off its inflow and updraft. Rain becomes lighter and eventually ends as the storm loses its source of moisture and lift.

-The downdraft may cause new thunderstorms to form nearby as the downdraft spreads out and meets additional warm, moist, unstable air.



For more information on thunderstorms and rising motions in the atmosphere go to:

http://www.erh.noaa.gov/rah/education/eduit.html